Underwater Speleology

Journal of the Cave Diving Section of the National Speleological Society

INSIDE THIS ISSUE:

Volume 48, No. 2
October 2021

Photo courtesy of Kirill Egorov

SAVE THE DATE: MAY 27-29, 2022

The NSS-CDS International Cave Diving Conference Returns

Scheduled Events:

Friday May 27, 2022: 5 pm-10 pm - Social at Robert B. Harkness Armory, Lake City, FL

Saturday May 28, 2022: 8 am-5 pm - Workshops at the Harkness Armory, followed by the annual membership meeting. Breakfast and lunch will be served.

Sunday May 29, 2022: "Demos 'n Diving" TBD dependent on weather and site conditions

SPEAKERS

MC: Paul Heinerth

Ricardo Castillo: Digital photogrammetry on the Yucatán peninsula.

Doug Ebersole, MD: Cardiovascular disease in aging cave divers

RAFFLES and PRIZES

Bahamas Underground: 3 days of guided diving in the Crystal Caves of Abaco

Cave Dive Florida: A 5-night stay at The Rum House in Ft White, FL

Dive Rite: A CHOPTIMA rereather

NSS-CDS: A lifetime membership

More information at: https://nsscds.org

Tickets and more information at Eventbrite:
https://www.eventbrite.com/e/2022-nss-cds-international-cave-diving-conference-tickets-174329242457

Facebook group page:
https://www.facebook.com/groups/706217592879456

Underwater Speleology
Volume 48, Number 2
October, 2021

contents

feature articles

columns

Cover: The fragile curtains of Crystal Cave, Grand Bahama Island. The area is too small to admit a diver without risking damage to the formations. © Cristina Zenato.

To our readers and members: Views represented in *Underwater Speleology* articles are solely the author's and do not reflect the views of the NSS-CDS Board of Directors or of the Editor.

We advocate freedom of speech and welcome discussion. Feel free to rebut previous articles and/or to submit your own.

The magazine encourages members to submit news, stories, letters, trip and exploration reports, maps, and photos for consideration. Please contact the Editor for publication guidelines to avoid duplication of work.

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UWS is a membership benefit. Information about membership fees and registration can be found at www.nsscds.org.

Please send address changes to cdsmanager@nsscds.org or to 295 NW Commons Loop, Suite 115-317, Lake City, FL 32005.

a note from the chair

by Jason Black

Good day everyone,

It has definitely been a tough year for everyone. But it looks as if we're starting to come out on the other side.

The big news is that we're going ahead with the 2022 NSS-CDS International Cave Diving Conference. Mark your calendars for May 27-29. The conference will be held at the Harkness Armory in Lake City, Florida.

We will kick off the weekend as usual with a Friday evening social. The Saturday meetings will run from 8 am to 5 pm with breakfast and lunch provided by our sponsors. The annual members' meeting will follow the conference. Sunday is devoted to diving and equipment demo (assuming that weather permits).

It wouldn't be a CDS conference without Paul Heinerth as emcee, which he has graciously agreed to do. Speakers so far include Doug Ebersole, MD, who will discuss cardiovascular disease in the aging cave diver, and Ricardo Castillo, who will update us on photogrammetry projects ongoing on the Yucatán peninsula. DIVE TALK has graciously offered to capture the conference highlights, conduct interviews, feature attendees, and share all the different sessions and activities online.

Our sponsors have generously donated some amazing raffle prizes. Dive Rite has donated a Choptima for a lucky diver. Our friends at Bahamas Underground are sponsoring three days of guided diving in Abaco's crystal caves. Cave Dive Florida/Jim Wyatt has donated a five-night stay at The Rum House in Fort White, FL. And the NSS-CDS is donating a lifetime membership.

Tickets for the conference and the raffles are for sale at:

EventBrite at (shortened link): https://tinyurl.com/5u826szr.

You also will find information on the NSS-CDS website: https://nsscds.org

and on our Facebook group page at (shortened link): https://tinyurl.com/yds29rbh

On a sadder note, we recently lost two of our longtime community members. Bill Rennaker, a cave diving pioneer and longtime NSS-CDS instructor, passed away in August at home with his family. And as we go to press, we are hearing that Jean "Beano" Nelson succumbed to a long illness. We will miss them greatly.

We have been working very hard, and I'm very excited for the upcoming year. Lots of new positive things are going on. Most of all, I'm looking forward to an amazing international conference.

I can't wait to see everyone back together again enjoying what we all love to do. Thank you all for your support, and stay tuned.

Jason Black
386-466-2113

The Wes Skiles Legacy Project

Tessa Skiles is creating a legacy web site to carry on with Wes' work of protecting and restoring Florida's springs. She's looking for stories, videos, and photos of Wes (especially from the '70s–'90s). If you have any, Tessa would like to include them. Send them to her at tskiles@karstproductions.com. Please include the subject "Legacy Website Content– YOUR NAME, STORY/IMAGES." Please include dates, locations, and names.

IN THE WORLD OF THE "HEIMS"

by Cristina Zenato

As I float in the small hole waiting for my buddy Kewin to join me, I glance down to the darkness that has swallowed the second half of my body. The layer of hydrogen sulfide is at least two feet thick. The exploration line is secured to a tree outside the hole, firmly rooted in the rocks. We decided it's the safest way to find it when we want to go diving. It hugs the lip of the ledge and disappears like anything else into complete darkness.

I lock my fingers in a firm "ok" around the line and start following it, using the other hand to feel the contour of the cave and create an image in my mind. The rocks are smooth; luckily, there are no speleothems to consider at the entrance and no outcropping to bump the head against. At eight feet, I start to see my hand, and the light placed on my helmet pierces through, creating a fog effect. At this depth, the water is blood red from the tannic acid. I am happy I can see where the line is and follow it.

Kewin had previously entered this hole to check for a possible cave; he surfaced triumphantly 15 minutes later. We are now descending together for our first exploration dive. His line proceeds through a small hole and a vertical bedding plane. At thirty feet, it settles into a cradle full of leaves and tree branches, like a cushion ready to stop a fast descent. It's one that I am never planning to use, or I am sure I would disappear through it. To test my thoughts, I try to measure it with my arm up to the shoulder, and I still can't find anything solid with my fingertips.

At 58 feet, the red water finally clears. It is a depth that I record in my mind because I have never encountered a tannic acid level so thick in any other cave.

Niflheim: sulphur and brimstone

After a few kicks, I reach the end of Kewin's line. I pull out my exploratory reel, "ok" with him, and proceed on exploring. We have entered what will become Niflheim, the land of the fog.

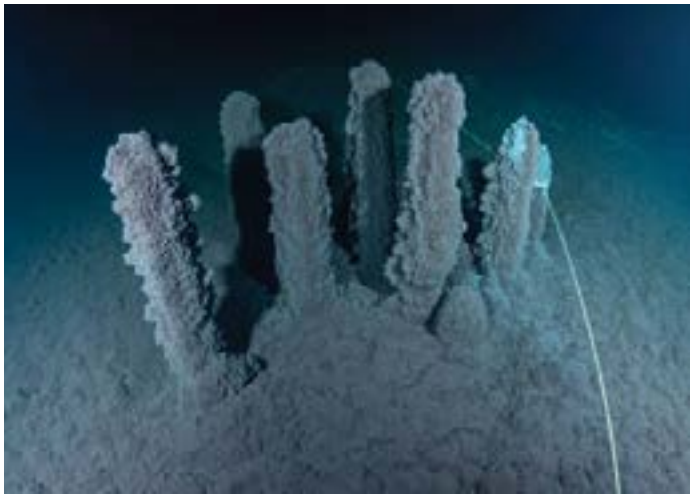
The cave is nothing I have seen before, yet we are on the same island where I have lived and explored caves for the last two decades. The floors, the ceilings, and the decorations are covered in layers of gray matter. Some appear like piled-up pine needles; some have the consistency of a crust.

The first room is vast with no flow. A light fog hangs in midwater; the recognizable smell of rotten eggs confirms the sulfide layer. Leaves and twigs pile along the height of the decorations, pushed by the current created during the flood from Hurricane Matthew.

I decide that the best course to follow is to go from decoration to decoration where the leaves are present; it proves a good tactic for the first dive. We lay over 2000 ft of line that Kewin surveys on the way in as I push a dozen feet ahead.

The tunnels lead to caved-in depressions. As soon as we reach 58 ft of depth, the water turns red. I can see that this cave will give us some work to be able to continue the exploration. We hope eventually to find other entrances, but we have not been lucky so far as it's challenging to find an opening with such a thick water column absorbing sunlight and the black layer on the surface.

Kewin swims through Niflheim. On the left: Kewin in the red zone.
© Cristina Zenato



The pine needles. © Cristina Zenato

Niflheim becomes our primary focus for the next few months. Diving here is rather strenuous. We can only park the car over 450 yards away. Then we have to carry everything first through a sloshy marsh, then through tall, sharp, and poisonous vegetation. Considering the entrance's remote location, we decide to create a base, leaving tanks and gear in a dry box hidden in the bush. We carry our rebreathers and drysuits back and forth. As we use sidemount rebreathers, we have AL 80s as a diluent tank. Every few dives, we bring back the "dil" tank to top it off. This system allows us to save some energy for the diving part.

After the first dive, Kewin and I split our efforts. He decides to investigate south, and I choose to continue north. Each dive, we carry one exploratory and one primary reel each; we both surface with them empty most days. The exploration goes relatively fast as the cave keeps giving. I find it beautiful, but I have always been inclined toward the darker caves.

Svartalfheim: Home to the dark elves

In a matter of a few months, we move our attention to the next entrance. I have always heard that there is a chance to have one good result for every 10 attempts at exploration. I am not sure that we will find another cave at this second location. But my doubts are unfounded, and the second entrance proves a good lead into another system.

How is it possible that no one ever found these entrances with all the explorers who have crossed this island? Famous cave explorers have walked Grand Bahama Island; perhaps it's the most explored island in The Bahamas. Dr. Dennis Williams, Sheck Exley, Rob Palmer, Brian Kakuk, and many others have driven through and flown over, searching for new systems. It's 2020, and we have just found not one but two new systems.

Luckily, the hike to this entrance is much shorter, though it is not at all easy. The water level is undoubtedly affected by tidal changes. At any given time, we can be in ankle-deep mud or knee-high water, tripping over mangrove roots and sinking through invisible holes up to our groin. We decide to set up a small walkway made of wood pallets to help our access, leaving us only the last ten yards to contend with.

This entrance is more expansive and blood red. But the black layer is not present, which allows us to view our surroundings as soon as we descend two feet below the surface. This time, I head south, and Kewin heads north. A slight current flows through the cave, changing direction every six hours. It is not strong enough to affect the exploration, but it shows that the ocean's presence and flow influence the cave. We decide to name it Svartalfheim, from the old Norse literature.

S is a dark world of deep rock and underground tunnels. The dwarves of legend, also known as dark elves, were the greatest miners ever to exist, building immense halls and cities under mountains. In there, we find a labyrinth of subterranean mines and forges underneath the world of humans.

The passages both south and north are small, low, and with quite a few grinding points. It's a place fit for these legendary creatures to live in. Yet after some

Through the small passages of Svartalfheim. © Cristina Zenato

In the land of the dwarves, Svartalfheim's large chambers. © Cristina Zenato

swimming, we both enter vast rooms, highly decorated, fitting to match the creations of the dark elves.

The more we explore these two systems, the more we understand this island's hydrology. We find the messages left behind by the hurricanes and their floods. We see the information on where and how the water moves. As we explore and discover, we continue to raise questions. Luckily some of them are answered by a dear friend and professor of hydrology and geology, Dr. Patricia Beddows; however, many more still lay in the darkness waiting to be addressed.

The exploration of both caves came to 35,588 ft of line laid and mapped in about six months of work between Kewin and me.

Logistics

We both used the Sidewinder sidemount rebreather and added one or two stages as we swam further and further into the caves (primarily, we were swimming). In some areas of Svartalfheim, Kewin was able to use the aid of a super-small and streamlined scooter, the Scubajet, to assist with pushing beyond the 5000 ft mark. Its primary use was to mitigate swimming fatigue, but all dives and bailouts were planned based only on swimming speed.

On my side, it was impossible to use even the smallest of scooters. We used to dive for four hours on a new sorb, followed by a two-hour dive to complete other tasks on the second part of the sorb. All dives were in drysuits; the average water temperature in the caves is 25 C (75-77 F). Due to the long submerged time and the presence of hydrogen sulfide, we felt it was the safest approach.

While the diving part was strenuous enough, the most challenging part for both explorations was reaching the entrance. We had to contend with the rugged terrain. Our efforts increased with the heat, the presence of numerous bugs, poisonous plants, and my favorite—the sudden thunderstorms that would catch us in the middle of our transits.

We're working on new legislation and had to put down our exploration reels. But as we are waiting for our permits to be approved, we are already planning for the next "heim."

— Cristina Zenato is an NSS-CDS cave instructor, explorer, photographer, and passionate conservationist. She lives and dives in Freeport, Grand Bahama Island.

Evaluating a Patient for Emergency Sump Rescue

by Michael A. Raymond and Dr. Richard Harris, BMBS, FANZCA

In June 2014, a caver exploring the dry Riesending cave in Germany suffered a traumatic brain injury from a rockfall. His group was 1000 meters deep in the cave. Three days later, two physicians reached him, came to an agreement about the diagnosis, and cleared him for movement. It took 11 days and more than 700 people to move him to the surface.

You may face similar challenges when evaluating a patient (or patients) during a sump rescue. After checking the air quality and ascertaining whether the patient presents a risk, you will need to conduct a medical assessment. This will help inform your exit plan.

While there are doctors with both the dry caving and cave diving experience necessary to conduct a sump rescue, they are few and far between.

Do you know what to do?

Evacuation options

On the surface, there are three basic options for dealing with a wilderness injury. The first is to treat the patient in place and continue the trip. The second option is to self evacuate to civilization for professional medical care. Some injuries cannot be treated without equipment or conditions not available in the back country.

The final option is rapid evacuation. This usually means a helicopter. Generally speaking, the sooner the patient gets to definitive care, the better the outcome. There's also the possibility of combining approaches: You could call the evacuation team, start moving the patient yourself, and meet the team closer to a road. This will enable the team to evacuate the patient even faster.

For dry caving, things are a little different. No helicopter is coming to get you. With a few exceptions, you can't make a telephone call. If a patient needs to be evacuated, your options include self rescue, sending a runner to get a rescue team, or a combination of the two.

In the Riesending case, one of the injured party's fellow cavers did a solo 10-hour climb to exit the cave to call for help. "Rapid" evacuation takes on a whole new meaning.

High-quality, low-cost training is available for this from the National Cave Rescue Commission (NCRC). In the initial week-long course, participants are introduced to patient assessment, patient packaging (how to wrap someone to keep him or her dry and secure to a litter), search, and rigging haul systems. In later courses, cavers learn to lead rescue teams of varying sizes, conduct more extensive medical care, and rig advanced rope systems.

One of the authors has assisted with teaching the Small Party Assisted Rescue (SPAR) course. In this course, cavers are trained to assess which patients can self rescue and how to help them to move using the minimal gear already in the cave.

In-water rescue

Divers learn a few basic skills in the Rescue Diver course. They are taught how to get a distressed diver safely to the surface, how to move the person, and to conduct rescue breathing. They learn how to remove someone from the water and about basic leadership on the surface. Patient assessment and care are kept to a minimum. Regardless of the incident's cause, drowning is a likely final outcome as long as the stricken diver is immersed.

For a sump rescue, the range of options and the method of choosing between them is technical. Until recently, the received wisdom in sump rescue was to leave the patient(s) in place. This was because our experience was almost entirely with rain-induced, short-lived sumps. A more comprehensive examination of the world-wide incident history has shown that at a minimum, sending a diver to check on the patient as soon as possible is recommended.

When leaving the patient in place is not a viable option, the choices are to find or make an alternate dry exit, have the patient swim out under his or her own power, or to swim the patient out. We'll cover how to choose between these options below.

Organizations like the National Outdoor Leadership School (NOLS) teach initial patient evaluation in great depth in their Wilderness First Aid and Wilderness First Responder ("woofer") courses. Evaluating the patient will identify what needs treatment, if the person is improving or getting worse, and what type of exit the patient can tolerate.

Patient evaluation

When you locate the patient in an air chamber, first check the air quality. The first priority is always personal safety and assessing the incident scene for hazards. Only then should you turn your attention to the patient.

First a little more about scene safety. You've already started this by checking for bad air and becoming confident that the patient won't jump you. Watch out for the possibility of rock fall. Is the water rising? Make doubly sure to secure your own equipment so that you don't get trapped here as well.

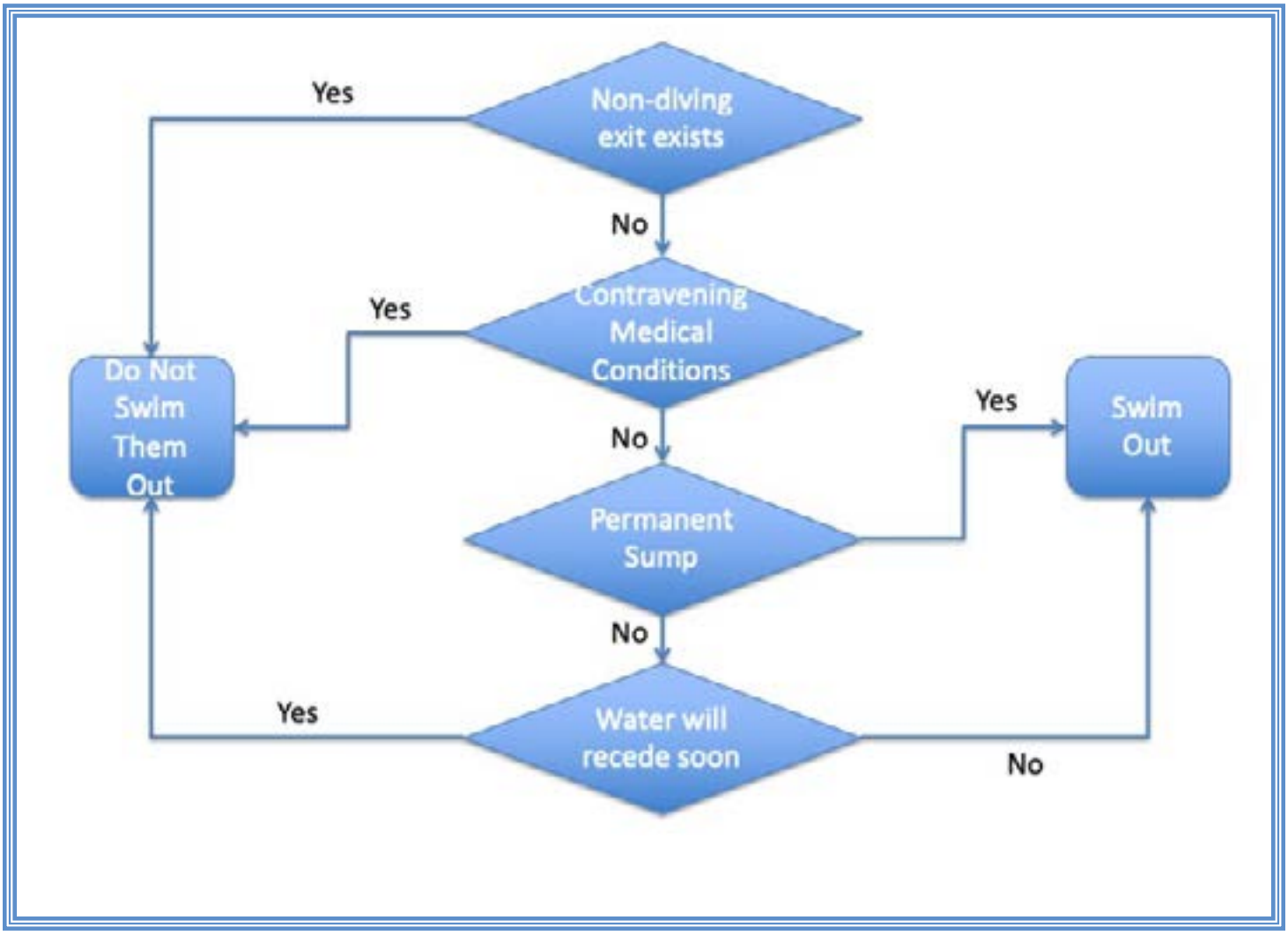


Figure 1: Exit Method Decision Tree

You're likely showing up after a patient has been trapped for some time. Someone who had an immediately life-threatening problem would likely already be dead. Still, any serious injury may preclude a lengthy dive out through a sump. A thorough assessment of the injured person's medical and psychological condition is critically important. We'll go over the basic steps.

You'll also want to make sure the patient feels safe about you. Get permission before you start poking and prodding. It's also never too early to start on psychological first aid.

Primary survey

Use the mnemonic "DR-ABCDE". Check the patient for a response, then check the ABCs: airway, breathing, and circulation. Treat any problems as you find them. If the chamber is running out of oxygen and accumulating CO_2, consider starting the patient on a regulator (and mask).

"D" is for debilitating injury: Is there a neurological or musculoskeletal injury keeping the patient in the cave?

"E" refers to "expose" or "exposure." This is one area that differs considerably from surface medicine. On the surface, one would usually expose any injuries for proper examination. If your patient is wearing a wetsuit or a drysuit, this is going to be a problem.

Cutting the suit open may make your job even harder. In addition to any other issues, your patient likely already has significant hypothermia. He or she may need to go back in the water to exit the cave. Even if you could get the suit off, are you sure you could get it back on? Could you do your evaluation through and under the suit instead? Unless you suspect uncontrolled bleeding, lean towards leaving the suit on. Monitor the patient's temperature early and aggressively.

Secondary survey

Suited or not, you'll need to perform a head-to-toe examination focusing on finding issues that will affect your exit plan. The most common dry caver injuries are extremity sprains and fractures. Operating dive gear without the use of the thumb or with a bad wrist can be a challenge. The same goes for kicking with an injured ankle.

Check for circulation, sensation, and motion in the hands and feet. The presence of pulses, extremity warmth, and normal skin color indicates adequate blood flow. Can the person feel your touch? Is there normal range of motion? These are good indicators of the patient's ability to travel.

The baseline level of consciousness is important to describe, as are any changes you note. Use the acronym "AVPU" —alertness, response to voice, response to pain, or unresponsive.
Check and record the vital signs, including pulse and respiration rates, blood pressure, pupillary size and responsiveness, and temperature. Most dive computers do not measure seconds, so it may be difficult to count an accurate rate.

It's difficult to palpate a pulse through a drysuit seal—and the radial artery is below the base of the thumb. Work around the seal or lift it back slightly. © Grace Hubbard.

The wrist and neck seals also may impede your ability to palpate the pulse. If you can feel a peripheral pulse (wrist or ankle) it suggests that the systolic pressure is at least 80 mm. The presence of a central neck or femoral pulse suggests at least 60 mm. No one expects you to take an exact blood pressure past a sump.

Is the heart rate roughly normal (70-90 beats per minute), rapid (greater than 100 bpm), or noticeably slow (less than 60 bpm)? We are interested only in extremes, not the exact rate.

Are respirations within normal range (12-18 per minute)? Is the effort normal or labored?

Assume that the patient is cold and will get colder. Take measures immediately to keep the person warm!

Write down your findings in your wet notes so you can monitor trends and report your findings to the surface medical team.

Medical history

Lastly, use the SAMPLE acronym to guide taking the medical history. What *symptoms* does the patient describe, and what signs do you observe? Is there a history of *allergies* to medications? What *medications* does the person take, and is s/he behind on the dosage? Is there a significant *past history* of disease,

such as diabetes? When was the person's *last* intake (food and drink) and output (urine and feces)? What *events* led up to any injuries and becoming trapped?

Decisions and judgment calls

With the evaluation in hand, you now have some decisions to make. There are many ways to get a person past a sump, the mechanics of which would each make for a good article. Your decision is whether to do a hasty rescue, stay in place to evaluate and stabilize the patient further, or to swim back and provide your data to the chain of command. A helpful decision tree is illustrated in Figure 1.

This decision tree does not cover the decision whether to do a hasty swim out or to return to the incident command team to plan a more deliberate approach. If the patient would be dead before help arrives, and if you think you could make the hasty rescue attempt with acceptably low risk to yourself, then the decision is clear. If you survive the attempt and the patient doesn't, then the result is no worse than if you hadn't made the attempt. Deciding your patient's odds of survival and your own risk level are not simple tasks, especially under time pressure.

If you don't need to conduct a hasty rescue, your evaluation is one part of the equation. The command team will look at three principal variables - the patient, equipment, and passage. The patient variable is affected by your evaluation and the patient's experience level and mental state. The available equipment and its condition may open up non-diving options or severely restrict you. Length, temperature, visibility, restrictions, alternate paths, impending weather, current, depth, and other variables affect the passage issue.

The determining factor

Armed with a proper patient evaluation, you and the incident command team are much better placed to make a good decision. By knowing if your patient is fully mobile, needs a little help, or needs intervention by medical professionals, you have the starting point for a plan. You enabled this with a thorough examination instead of focusing only on the most obvious issue(s). In the case of the Riesending cave rescue, the team's confidence in the patient's medical condition enabled them to rig for speedy movement as opposed to an excessively gentle and slow approach.

Even if you're not an experienced trauma physician, your ability to evaluate a patient can have a huge beneficial impact.

Mnemonics for Patient Evaluation

PRIMARY SURVEY: *DR ABCDE*

D	Danger
R	Response– See AVPU
A	Airway
B	Breathing
C	Circulation and hemorrhage control
D	Debilitating injury
E	Expose/exposure + hypothermia

RESPONSE ASSESSMENT: *AVPU*

A	Alert
V	Responds to voice
P	Responds to pain
U	Unresponsive

HISTORY TAKING: *SAMPLE*

S	Symptoms
A	Allergies
M	Medications
P	Past medical history
L	Last ate; last urine/feces
E	Events leading to situation

Michael A. Raymond is at work on a series that explores controversies and best practices in sump rescue. He is Associate Editor for Underwater Speleology.

Dr Richard Harris is an Australian anaesthesiologist who has been an exploration cave diver for many years. He has a longstanding interest in cave rescue.


BARE

Understanding Underwater Cave Rescue: A Call for Cross Training and Practice

by Germán Yáñez Mendoza

Caving rescue teams around the globe work constantly to respond to crises quickly, efficiently, and safely. This volunteer work takes a different form in each country according to the terrain and local techniques and philosophies. All teams have developed interesting ways to help cavers. Cave and cave diving rescue requires not just training and experience but also the important element of creativity. Because each scenario is different, on-site rescue may require methods not described in books or used by other rescue schools.

Cave rescue vs. recovery

Cave rescue is a ”highly specialized field of wilderness rescue in which injured, trapped or lost cave explorers are medically treated and extracted from various cave environments” (Wikipedia 2021). Recovery, on the other hand, is the act of “bringing back to the surface a buddy with no vital signs from an underground environment” (author’s definition). All cavers and cave divers should understand the distinction.

Origins suggest technical differences

Modern cave rescue began in 1962 with the first congress in Brussels, Belgium. Groups from different European countries began to organize and to develop protocols and techniques. Most importantly, they established a resource to help others. From this congress sprang the British Cave Rescue Council (BCRC), the first cave rescue organization. Ten years later, the Spéléo Secours Français (SSF, or French Caving Rescue) was born, followed three years later by the US National Cave Rescue Commission (NCRC). Today all of these groups remain well organized and stand ready to support other groups worldwide if they have a need in a cave rescue operation.

The history and groups’ origins help to explain how their techniques are similar but not the same. Some groups started using mountaineering principles, others urban rescue techniques, still others caving practices. Each region’s practices and technologies vary according to the types of caves and environmental conditions, which in turn determine equipment and configuration, use and access.

Individual teams differ according to their field experience with real accidents, their communication systems, and their technology. The number of volunteers and specialized cavers further defines the team’s practices, as does the individual background of each caver.

After 32 years as a caver I can see the pros and cons of each school and philosophy. The point is not to judge who has the better way, but to understand that we as rescuers may need to adapt to the conditions, situations, and laws of a different country while working as a unit.

At the end of the day, the different schools all work fine. What’s important is to understand the need for conducting training and rescue exercises continuously with our own groups and with other groups. In this way our knowledge increases, and we learn other ways to work. One day you may need to use that way.

What about underwater cave rescue?

Probably the first underwater cave fatality documented was in 1949 in England’s Wookey Hole. Great Britain’s Cave Diving Group (CDG), the world’s first cave diving organization, was also the first to document an underwater cave recovery. The victim’s name was James Gordon Ingram Marriot.

In 1977 during an international cave diving camp in Great Britain, the Cave Diving Group (CDG) formed the first section of underwater cave rescuers. Its goal was to assist in underwater cave accidents using a methodology.

Five years later, the Cave Diving Section of the National Speleological Society (NSS-CDS) authorized creation of an organized group for rescue and recovery missions. Sheriff Henry Nicholson, an NSS-CDS instructor, led the group which included divers from both the NSS-CDS and the National Association for

Packing in water, food, and medical supplies. © Germán Yañez

Cave Diving (NACD). The group evolved into what is today the International Underwater Cave Rescue and Recovery Organization (IUCRR) under the direction of Henry Nicholson and Robert Laird in 1999. Today this great organization offers workshops and creates liaisons with local and international authorities to resolve underwater cave accidents. It assists law enforcement, more often with recoveries than rescues. The IUCRR is the authority for cave rescue/recovery in all of the Americas.

Getting organized in México

Formal underwater cave rescue started following accidents in different regions of México. During the 1980s, a major politician's son died in an underwater cave in Chacalal Bay, Puerto Aventuras, Quintana Roo. In those times we didn't have cave divers trained in recovery. The victim's family called Steve Gerrard to help them. This was the first organized, methodical underwater cave recovery made in a spring in México.

Two other early events in México involved sumps. The first was the fatality of Ian Roland, a British cave diver who died in 1994 during Bill Stone's Huautla expedition. The team was able to perform a successful recovery in this very technical cave.

The second event occurred in the mountains of Puebla in 2004. Mariano Fuentes died while attempting to connect Oztoque cave with a second sump. The recovery was a challenge for us as Mexican underwater cave rescuers. We joined forces with Steve Omeroid and Dave Milhollin, learning from them other techniques and methods to search and recover a caver in a sump.

Conditions were really bad in terms of visibility, temperature, narrow passages, and logistics. The team decided this operation was too high risk, so we focused first on bringing the equipment to the surface. Mariano's body could not be recovered.

This sad event represented the first team effort for Mexican cave divers learning sump recovery. The team consisted of Juan Carlos Carrillo, Alejandro Álvarez, and myself. In spite of the tragedy, it was a good introduction to learning how complex a sump can be.

At the end of the 1980s I had the chance to meet Parker Turner and Steve Gerrard. They wanted me to take a recovery class so that I could help respond to emergency cave situations in my country. I was unable to do this because it was difficult for me to travel to the US.

Later, Steve called me to ask if I could go cave diving with Henry Nicholson when he visited México. I proposed to Steve that Henry could teach a group about cave recovery methods and protocols. After a couple of days Steve called back to confirm that Henry would teach. This was the first underwater cave recovery class in México. I am lucky to have had the honor of meeting Henry and to be trained by him.

A sherpa transports gear through the sump. © Germán Yañez

Swimming the stretcher to the next dry area. © Germán Yañez

A few years later we had the chance to work with Lamar Hires under the auspices of IUCRR. We organized a workshop to train members of the Circulo Espeleológico del Mayab A.C as IUCRR first responders.

"Speaking the same language"

Today we can see a 'fracture' between rescue operations in dry caves versus underwater caves. By "fracture," I mean that each team often doesn't understand well what the others' jobs involve: They speak in different languages, which is something should be avoided. Both dry rescuers and underwater cave rescuers should understand the role each has in a mission and their personal capacities and limits.

In dry cave rescue, all is well established. The team understands the many skills needed, such as rigging, underground communication, hauling systems, pulley systems, transporting a stretcher, and more.

By contrast, most cave divers are not trained in these activities, which complicates the chain of command during more complex scenarios.

In addition to having strong cave diving experience, cave divers should ideally get involved in dry cave rescue protocols. This will promote understanding of the different roles to be had during a cave rescue, which is not always in an underwater cave.

Different time constraints, logistics, and skill sets

Conducting a recovery in a sump is markedly different from a spring recovery. Both environments present their own challenges.

Springs, for example, can have long underwater passages, strong flow, and significant depths. They mostly (but not always) have good visibility. However, it is generally recognized that the victim is already dead. The recovery team can take all the time it needs to plan and to gather the divers. There is no hurry to stabilize the patient, no need for complex lifts and stretchers, no rush to medical care. In other words, the job is all underwater and with no time pressure.

In a sump operation, the local authorities usually designate an incident commander. All rescuers, whether underwater or dry cave, must understand the operation's hierarchy. This means respecting the commander's decisions and conforming to the operation's hierarchy, regardless of prior experience or disagreements.

The team may be underground for weeks in a remote location. Staging the operation may require them to create hot points and bivouacs. It goes without saying that everyone involved needs self rescue and survival skills.

Sump rescuers absolutely must be well versed in single-rope techniques. Deep vertical pits require careful negotiation, sometimes for many hundreds of meters, on rope. Rescuers must be able to set up and check their own rigging, as well as rig and manage the stretcher, the hauling systems, and the pulley installations. They will be installing spits or drilling parabolts, then drilling, diving, and doing it again. And again.

After reaching the patient, rescuers will need to evaluate and stabilize the person—to maintain the airway, stop major bleeding, protect against hypothermia, and treat major injuries, such as immobilizing fractures *(see related article in this issue).*

The team decides about how the transport can most safely be accomplished. The visibility usually is bad. A full-face mask is the safest way to evacuate an injured person through underwater passages.*

Sometimes the dry rescue cavers don't dive, so after the first sump the diver must be able to do everything that that the dry cavers did in the first chambers.

Knowledge base for rescue and recovery divers

In addition to law enforcement aspects, trainees should learn about:

- the Incident Command System;
- proper rigging techniques;
- the proper use of pulley and haul systems;
- how to rig and safely mobilize a stretcher in dry areas or underwater passages;
- advanced first aid;
- underground communication systems;
- full face mask use for unconscious patients in sump transitions;
- survival skills;
- single-rope techniques; and
- teamwork.

Open-circuit scuba is acceptable for practice. But using a full face mask is the safest way to swim an unconscious diver out of a sump. © Germán Yañez

So the cave itself is like a filter: The further you penetrate, the more skills you must know. This is something all cave divers who are involved in a rescue operation must understand.

When responding to a rescue or recovery operation, we need to observe before we act. If we are on site first, we should act as first responders. We can start organizing the command post, obtain information from witnesses, get the GPS coordinates, and assess for logistics. What is the operation likely to need in terms of communications, ropes, underwater equipment, food, tenders, access, diving gases, and rigging equipment?

Firefighters, police, army, civil guard members, and urban rescuers initially work hand-in-hand with cave rescuers. Once they see the complexity and the skills that these missions require, however, usually they let the cave rescue organizations work with their own methods.

Perspective, practice, and creativity

Performing a cave rescue in a dry or underwater cave is not for everybody. It is not fun. We need to leave the egos behind and ask ourselves if we genuinely are qualified for such a mission. Being a rescuer requires years of not just continuous training, but also

** The photos of rescuers practicing exercises with conventional scuba assume that the patient is conscious and fairly well. The best way to remove an unconscious diver from a sump is with a full face mask.*

participating in field exercises with different groups. Each experience gained is part of a learning process.

Remember that something that may work in Florida caves may not work in Thai caves, or even worse, in Central México's deep pits and sumps such as Huautla. Every scenario is different, and we are not all prepared for all rescues. This is especially true if you haven't practiced performing rescue exercises with other groups in many cave scenarios. Even if the caves are similar, each cave usually requires creativity during a real incident or accident.

You should always have with you your imagination and creativity. By using these qualities in the rescue field, you will always be one step ahead.

Prevention is the key: Don't be part of the problem. You may want to help—but by making a bad decision you could create a problem during a rescue operation ,or worse, become a victim.

Be safe.

During the last two years, I have been working on an underwater cave rescue manual for the Mexican Federation of Diving Activities (FMAS-CMAS). My goal is to streamline the basic concepts we use in dry cave rescue so that 1) underwater cave rescuers understand them and 2) we all speak the same language. This manual does not attempt to establish one method; it considers different ways that we can perform a rescue or recovery and what is required to complete the mission.

Please feel free to contact me if you are interested in underwater cave rescue methods. I can also point you toward information about rescue groups in your country. — *Author's note*

Germán Yañez is a cave diving explorer and instructor in México and a long-time member of NSS-CDS. He teaches cave rescue for the Escuela Latinoamericana de Espéleosocorro (ELE, the Latin American School of Caving). Germán also is member of the underwater cave rescue commission of the International Union of Speleology (UIS). He is the author of manuals and articles for the Mexican Federation of Underwater Activities (FMAS).

Removal from the water. **© Germán Yañez**

Depth, Rebreathers, and RECKLESS DIVE PLANNING

by Joe Citelli

The fascination with depth among newer rebreather divers has always given me pause. What are the thought processes that go with this fascination? From a pragmatic viewpoint one could say you go down, swim around, and come back up. Certainly with today's technology, this is it is not an unreasonable assumption.

Or is it?

Rationalizing that you can successfully manage the challenges presented by deeper dives creates an attractive proposition, especially for the newly certified, less-experienced diver. It becomes very tempting for them to emulate others who appear to have successfully negotiated the path they are contemplating— one which exceeds their current level of training and experience.

Nothing can be further from the truth. While on any given day anyone could successfully complete a deep dive below (100 meters/330 ft), when things go awry it is only experience that will save you.

Excursions below 100 meters require more than just meticulous planning. They require that plus a highly developed skill set that is only created by spending a vast amount of dive time developing the muscle memory necessary to survive. Skills learned and perfected in a class need to be securely cemented into memory by repetition over time.

Instinct and the ability to spontaneously make the correct decisions under duress are what will permit you to successfully solve problems below 100 meters. If you have to think about what to do, you are probably already doomed.

There was a time when 100-plus meter dives were the domain of a small number of divers who had the requisite open-circuit skills and were committed to perfecting them. You needed to manage large numbers of bottles with multiple gases and oftentimes had to cut your own tables. Rebreather and computer technology was not yet developed and mainstream. There were no Shearwater computers, nor were there any of the rebreather options available today.

Fast forward to 2021. Almost anyone with the money can buy a rebreather, purchase some training, and be doing 400- and 500-ft (130-160 meter) dives in a relatively short period of time. In most instances s/he will be successful because the technology is so evolved that it's easy to be lulled into a false sense of security. If nothing goes wrong, a chimp can be trained to dive to 500-foot depths in a few weeks. What can't be done is to train the chimp to react appropriately when things go seriously wrong. Only time and experience can accomplish that.

So about now you might be wondering about my motivation to write this piece. It's actually quite simple and straightforward. Over the past few years I have been seeing people on rebreathers routinely diving beyond the level of their training and knowledge base and, far more importantly, beyond their experience levels.

Having a certification does not mean you have the experience or the knowledge to recognize a bad dive plan, especially when it is proposed by someone you perceive to be an expert. Certification only gives you the opportunity to learn and expand your skill set so you can evolve and gain experience. It also gives you the opportunity to make bad choices. It does not always prepare you to recognize poor planning.

For instance, I have been hearing tales of divers running outrageously high ppO_2s on dives deeper than 100 meters as part of an effort to reduce the decompression obligation. This is a diver's form of Russian roulette. Because you won yesterday does not mean you will win today.

All of us participating in advanced technical rebreather diving have at the very least, a bit of Type A personality. We all like to push the envelope. It is part of our personality. That is fine as long as we never let it morph into recklessness.

Running a high $pp0_2$ to shorten decompression time on a deep rebreather dive is akin to playing Russian roulette. Blanc, Mel. 2008. Looney Tunes golden collection. Volume 6 Volume 6. Burbank, CA: Distributed by Warner Home Video.

There is a huge difference between managed risk and normalization of deviance. All too often we dismiss risk because we succeeded in the past. Appropriate precautionary steps are overridden by unrealistic expectations of a successful outcome.

Goal-oriented enthusiasm should never override critical evaluation of an activity that we're about to undertake. Without such evaluation, the goal may be accompanied by tunnel vision that cloaks any risk mitigation analysis you may have done.

So, in summary, one should ponder the following questions before engaging in any serious deep rebreather dive:

- Is the risk worth the reward?
- Am I willing to gamble my life for it?
- Is the plan viable?
- Are there appropriate safety measures in place?
- If I were to experience a total equipment failure, could I survive it?
- Is my skill set such that I am confident in my abilities to manage any problem that might come my way?
- Am I confident in my abilities to efficiently render assistance to a distressed team member?
- Am I confident in the abilities of my team members?
- Am I able to competently deal with decompression sickness, and is the necessary equipment available to do so?

There is no set of correct answers to the above questions. These are only thoughts that divers should ponder before undertaking any extreme depth dives.

I truly believe in freedom of choice. If the risks are acceptable to you, I say go for it. My only caveat is to know exactly what you are getting into before you commit.

Joe Citelli teaches cave diving, open- and closed-circuit rebreathers, mixed gas, wreck, and other technical diving. He is a past president of the NSS-CDS Board of Directors.

In Memoriam
Bill Rennaker

Almost every cave diver has heard of Bill Rennaker and his famed Cave Excursions. Bill passed away at home with his family next to him in August of 2021.

After a 30 year career at AC Delco in Indiana, Bill retired and moved to Luraville, FL, to pursue his passion of cave diving. His accomplishments in the sport could fill a book. Most of the North Florida cave diving maps have his name on them. It's is impossible to realize the full value of what he gave. Bill was a true cave diving pioneer and pushed it to new levels. Everyone has benefitted from his contributions.

Bill's son David said in his eulogy, "Bill was a unique individual." He was unique and much more. The essence of Bill Rennaker was how much he cared for other people around him. His way was sometimes gruff - but caring for others was the driving force behind why and how he conducted himself.

One example is how Bill changed the way in which cave diving shops supplied breathing gas. There were two, equally important, parts to this change. To understand the importance, we need to consider the industry mindset at the time. Fills were at that time sold by the cylinder, regardless of how much gas was left in the cylinder. This meant that most cave divers would recalculate after a dive, and continue to dive until the cylinder(s) were almost empty. This practice increased the risk for each subsequent dive because of a narrower safety margin in case of a failure or time-consuming problem.

Recognizing this problem, Bill started selling gas fills by the cubic foot. It didn't matter if you brought the cylinders nearly empty or with 1/3 of the gas left in them. You only paid for how much gas you needed. Today this seems like common sense. At the time, however, most shops thought Bill wouldn't make it a year. Bill Rennaker was the driving force behind the change, and his reason was purely for the safety of his fellow cave divers.

His second major safety contribution was banked Nitrox. At the time the dive industry was forcefully pushing back against the use of Nitrox. Partial pressure blending (using pure O_2 topped up with air) was the only way for shops to blend Nitrox. The industry's heavy hitters believed that having pure O_2 in shops was far too risky, so they opposed using Nitrox. Bill realized that it could be done safely on a large scale and that the safety benefits were well worth the effort. Both of these innovations made cave diving much safer and are now the standard at every respectable cave diving shop.

Bill helped improve safety in innumerable other ways. He set an example of how to improve training standards for cave divers as they learned the art of the sport. He did the thankless job of recovering bodies when needed, and he helped to make the recovery process safer for other divers as well. Bill contributed time, money, and legitimacy to the non-profit cave diving organizations. He also gave completely when it came to mentoring and helping others safely enjoy the sport.

Bill didn't just have a "dive shop." He helped to create a community that owes so much to him for his contributions. Bill didn't just have customers - everyone who came into his shop was both friend and family. He often loaned equipment to divers who needed it when he could have rented it instead. He gave freely of his knowledge to help others improve. While most explorers held their finds closely secret so as to not get "scooped" by others jumping over them, Bill shared possible leads for divers who wanted to explore.

Bill broke the mold. There is a long list of people who've contributed to cave diving and have done some great things. Bill stands with those great people. In proper "Bill" fashion, he did things in his own unique way.

—Bobby Franklin

Photos courtesy of Linda Rennaker Strait (over for more photos).

remembering Bill...

Bill and his daughter, Linda Rennaker Strait, welcome divers at Cave Excursions

Cave Diver Training Update

by Max Kuznetsov

NSS-CDS Training Director

Over the past several weeks, Training Committee members have been beta testing a new certification process. We are working out the final bugs and are hoping to launch shortly. Some of its features include:

Students will be able to enter their contact and other personal information ahead of time, including uploading a photo. This can lessen the workload on instructors.

Once student info is in the system, whether entered by either the student or instructor, it need not be re-entered each time the student achieves another certification level.

For students who are pre-registered, certification will involve little more than selecting the certification level, entering course dates and Certify.

Instructors will be able to preview each student's c-card prior to finalizing the certification. Student photos will be added to the card automatically. Each card will also have a certification number.

Although the new system will be substantially different from what we are currently doing, it is easy and intuitive.

Jean Nelson

© Tracy Simon

Jean "Beano" Nelson passed away on October 9, 2021, following a period of declining health. Jean was known for her kindness, her smile, and humming while underwater. She knew the Peacock system well and enjoyed showing her favorite places to her friends.

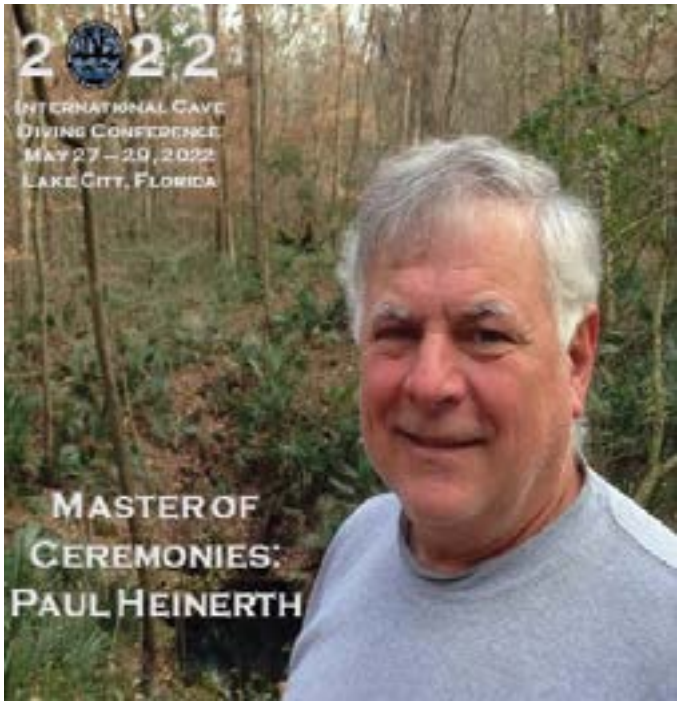
There will be a celebration of Jean's life at Amigos Dive Center on November 27, 2021, at 3 pm through the campfire. A few volunteers are chipping in for burgers and hot dogs and ask that people bring a dish to share.

See details and respond here: https://www.facebook.com/events/193729519555136/?ti=ls

Tickets are now available for

the 2022 NSS-CDS International Cave Diving Conference

A conference just isn't a conference unless it's being MC'd by Paul Heinerth. We are lucky enough to have him do it again for the 2022 NSS-CDS International Cave Diving Conference. A big thanks to Paul for his longtime support!



Tickets and more information at Eventbrite:
https://www.eventbrite.com/e/2022-nss-cds-international-cave-diving-conference-tickets-17432924245

CONFERENCE VOLUNTEERS NEEDED to help with planning, organization, setup, and more. Contact Renée Power at treasurer@nsscds.org or at 407.697.0552.

Thanks to Our Sponsors

Below you'll find a listing of the instructors who were in Active status as of 26 March 2020. Because this can change, you will want to go to the NSS-CDS website for the most up-to-date instructor listings. For each instructor, you will find:

- ☐ Current instructor rating
- ☐ Authorized specialty instructor ratings
- ☐ Clickable buttons that will take you to the instructor's website, Facebook page and email

Bahamas

Cristina Zenato 325

Mexico

Juan Carlos Carrillo 342
Ricardo Castillo 386
Jonathan Kieren 397
Olivier Prats 384
Luis Sanchez 387
Michael Silva Netto 398
Roger Williams 396

Russia

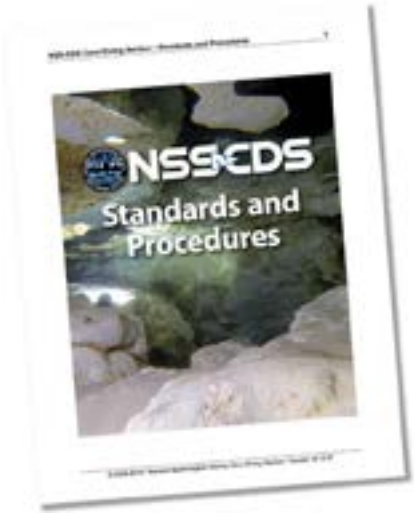
Elena Kryzhanovskaya 382
Maxim Kuznetsov 352
Timofey V Novikov 393
Evgeny V Runkov 371

USA

Harry Averill 218
Brenton C Booth 241
Chris Brock 392
Peter Butt 186
Mel Anne Clark 373
James Draker 395
Steven D Forman 106
Mark E Fowler 379
Georges Gawinowski 369
Jill Heinerth 340
Paul Heinerth 165
Lamar Hires 191
Thomas L Johnson 368
Jonathan Kieren 397
Maxim Kuznetsov 352
Jeff M Loflin 360
Mal Maloney 374
Bill Oestreich 253
Daniel C Patterson 353
Conrad Pfeifer 287
Renee S Power 383
Ken Sallot 390
Edd Sorenson 375
Pam Wooten 388
Jim Wyatt 355
Timothy Young 400

Western Europe

Johan Asplund 399
Martin J Robson 350
Phillip Short 365
Jose Mario Roberto Ventura 389
Sébastien Wilem 394



There's more in store…

Up-to-date instructor listings are not all you will find on the NSS-CDS website. Among other things, you can:

- ☐ Renew your CDS membership
- ☐ Order books and apparel
- ☐ Replace a lost cart
- ☐ Contact CDS Board members

In the *Training* section, you will find an in-depth description of all current NSS-CDS diver training courses. You will also be able to download the current standards for each CDS course. Here you will find:

- ☐ Student prerequisites
- ☐ Required dives, bottom time
- ☐ Course content
- ☐ Skill requirements
- ☐ Limits of training

Cave Diving Section of the
National Speleological Society, Inc.
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